Probability

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

Probability

Experiment

A coin th. $\{H, T\}$ — outcome

$S = \{H, T\}$ — Sample Space.

$n(S) = 2$

Event → A = No of Head = $A = \{H\}$ ⇒ $n(A) = 1$

B = No of Tail = $B = \{T\}$ $n(B) = 1$

$$P(A) = \frac{n(A)}{n(S)} = \frac{1}{2} = \frac{1}{2}$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{1}{2}$$

GAMMA CAREER CLASSES
...THS BY CHIRAG VANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$A \cup B$: A or B

$A \cap B$: A and B

$$P(A \cap B) = P(A) + P(B) - P(A \cup B)$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

Complement (A^c or A' or $\bar{A}$)

$$P(A^c) = 1 - P(A)$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

Conditional Probability

given Condition.

$$P(A|B) = P(B|A)$$

$$\frac{P(A \cap B)}{P(B)} = \frac{P(A \cap B)}{P(A)}$$

$$P(A) = P(B)$$

A and (B) — event already Done/given.

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

already done

OR

$$P(A|B) = \frac{P(B \cap A)}{P(B)}$$

$$P(A \cap B) = P(B \cap A)$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

If $P(A)=\frac{6}{11}$, $P(B)=\frac{5}{11}$ and $P(A\cup B)=\frac{7}{11}$ then find

i) $P(A\cap B)$

$$P(A\cup B) = P(A)+P(B)-P(A\cap B)$$

$$P(A\cap B) = P(A)+P(B)-P(A\cup B)$$

$$= \frac{6}{11}+\frac{5}{11}-\frac{7}{11}$$

$$P(A\cap B) = \frac{11}{11}-\frac{7}{11}=\frac{4}{11}$$

ii) $P(B|A)$

$$P(B|A)=\frac{P(B\cap A)}{P(A)}=\frac{P(A\cap B)}{P(A)}$$

$$P(B|A)=\frac{\frac{4}{11}}{\frac{6}{11}}=\frac{4}{\cancel{11}}\times\frac{\cancel{11}}{6}=\frac{2}{3}$$

$$P(B|A)=\frac{2}{3}$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR
DOWNLOAD : GAMMA CAREER CLASSES AAP!

Evaluate $P(A \cup B)$ if $2P(A)=P(B)=\frac{5}{13}$ and $P(A|B)=\frac{2}{5}$

$2P(A) = P(B) = \frac{5}{13}$

$P(A) = \frac{1}{2} P(B)$

$P(A) = \frac{1}{2} \times \frac{5}{13} = \frac{5}{26}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{5}{26} + \frac{5}{13} - \frac{2}{13} = \frac{5+10-4}{26} =$

$= \frac{15-4}{26} = \frac{11}{26}$

$P(A|B) = \frac{P(A \cap B)}{P(B)}$

$\frac{2}{5} = \frac{P(A \cap B)}{\frac{5}{13}}$

$\frac{2}{5} \times \frac{5}{13} = P(A \cap B)$

$P(A \cap B) = \frac{2}{13}$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR
DOWNLOAD : GAMMA CAREER CLASSES AAP!

A die is thrown twice and the sum of the numbers appearing is observed to be 7.what is the conditional probability that the number 2 has appeared at least once?

A = Event that Sum is 7 $(1,6)(2,5)(3,4)(4,3)(5,2)(6,1)$

B = Event that $(2,1)(1,2)(2,4)(2,5)(2,3)(2,6)(4,2)(5,2)(3,2)$

$A \cap B = \{(2,5)(5,2)\} \Rightarrow n(A \cap B) = 2$

$\boxed{n(S) = 36}$

$n(A) = 6$

$$\boxed{P(B/A) = \frac{P(A \cap B)}{P(A)}}$$

$$\boxed{P(B/A) = \frac{\frac{n(A \cap B)}{n(S)}}{\frac{n(A)}{n(S)}} = \frac{2}{6} = \frac{1}{3}}$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR
DOWNLOAD : GAMMA CAREER CLASSES AAP!

Given that the numbers appearing on throwing two dice are different . find the probability of the event the sum of the numbers on the dice is 4

$A = \{(1,2),(1,3),(1,4),(1,5),(1,6),(2,1),(2,3),(2,4),(2,5),(2,6),$
$(3,1),(3,2),(3,4),(3,5),(3,6),(4,1),(4,2),(4,3),(4,5)$
$(4,6),(5,1),(5,2),(5,3),(5,4),(5,6),(6,1),(6,2),(6,3)$
$(6,4),(6,5)\}$

$A \cap B = \{(1,3),(3,1)\}$

$n(A) = 30$

$B = \{(1,3),(3,1)\}$

$n(B) = 2$

$$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{\frac{n(A \cap B)}{n(S)}}{\frac{n(A)}{n(S)}} = \frac{2}{30} = \frac{1}{15}$$

GAMMA CAREER CLASSES

DOWNLOAD : GAMMA CAREER CLASSES AAP!

Multiplication theorem on Probability

A and B

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

$$\boxed{P(A \cap B) = P(A) \times P(B|A)}$$

$$P(A \cap B \cap C) = P(A) \times P(B|A) \times P(C|A \cap B)$$

DOWNLOAD : GAMMA CAREER CLASSES AAP!

A bag contains 10 white balls and 15 black balls . Two balls are drawn in succession without replacement. Find the probability that the first ball is white and the second is black. — B

— A

$P(A) = P(\text{getting a white ball in the first draw})$

10-White. A
15-Black. B

Total=25

$P(A) = \frac{10}{25} = \frac{2}{5}$

$P(B|A) = \frac{15}{24} = \frac{5}{8}$

$P(A \cap B) = P(A) \cdot P(B|A)$

$P(A \cap B) = \frac{2}{5} \times \frac{5}{8} = \frac{1}{4}$

$P(A \cap B) = P(A) \times P(B|A)$

$= \frac{10}{25} \times \frac{15}{24} = \frac{1}{4}$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

Independent Events

$$P(A \cap B) = P(A) \times P(B/A)$$

$$P(B/A) = P(B)$$

$$P(A/B) = P(A)$$

$$P(A \cap B) = P(A) \times P(B)$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

If A and B are two independent events with P(A)=0.3 and P(B)=0.4 then find

i) $P(A \cap B)$ ii) $P(A \cup B)$ iii) $P(A|B)$ iv) $P(B|A)$

(i) $P(A \cap B) = P(A) \times P(B)$

$= 0.3 \times 0.4$

$= 0.12$

$P(A \cup B)$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= 0.3 + 0.4 - 0.12$

(iii) $P(A|B) = \frac{P(A \cap B)}{P(B)}$

$P(A|B) = \frac{0.12}{0.40} = \frac{12}{40} = \frac{3}{10}$

(iv) $P(B|A) = \frac{P(A \cap B)}{P(A)}$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

A die is thrown two times. if A and B be the events, same number each times and a total score is 10 or more respectively determine whether or not A and B are independent.

$S = \{(1,1)(1,2)(1,3)(1,4)(1,5)(1,6)(2,1)(2,2)(2,3)(2,4)(2,5)$
$(2,6)(3,1)(3,2)(3,3)(3,4)(3,5)(3,6)(4,1)(4,2)(4,3)$
$(4,4)(4,5)(4,6)(5,1)(5,2)(5,3)(5,4)(5,5)(5,6)(6,1)(6,2)$
$(6,3)(6,4)(6,5)(6,6)\}$

$n(S) = 36$

$P(A \cap B) = P(A) \times P(B)$

$A = \{(1,1)(2,2)(3,3)(4,4)(5,5)(6,6)\} \Rightarrow n(A) = 6$

$B = \{(4,6)(5,5)(5,6)(6,4)(6,5)(6,6)\} \Rightarrow n(B) = 6$

$A \cap B = \{(5,5)(6,6)\} = n(A \cap B) = 2$

GAMMA CAREER CLASSES
LECTURES BY ASHWANI SIR
DOWNLOAD : GAMMA CAREER CLASSES AAP!

$$P(A \cap B) = P(A) \times P(B)$$

$$\frac{n(A \cap B)}{n(S)} = \frac{n(A)}{n(S)} \times \frac{n(B)}{n(S)}$$

$$= \frac{4}{36} \times \frac{6}{36}$$

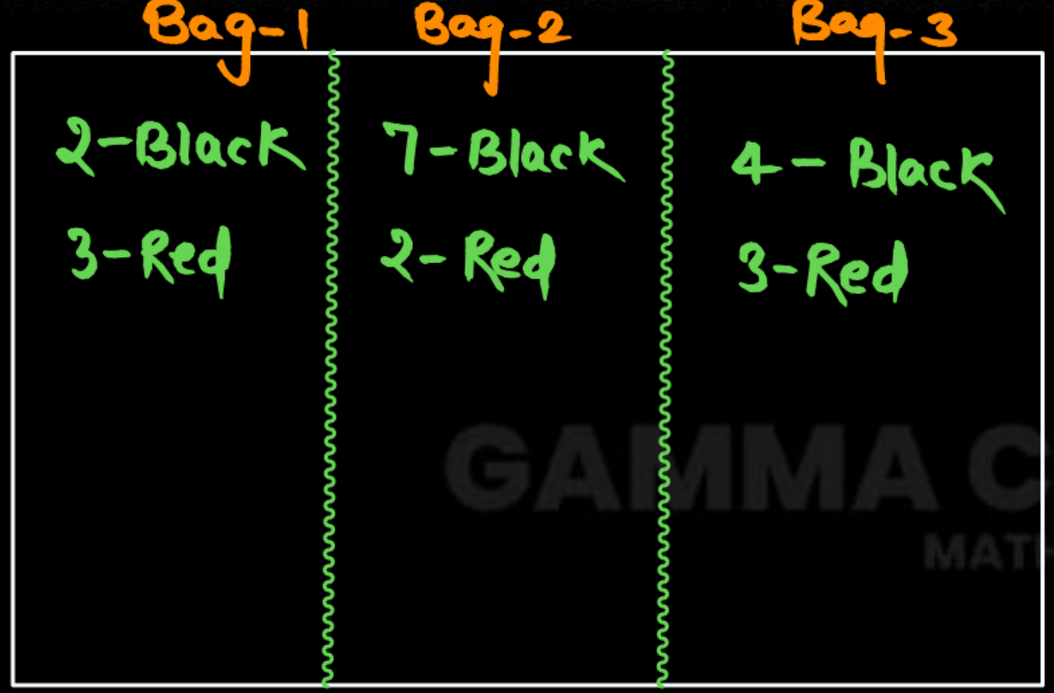
$$\frac{2}{36} \neq 1$$

It is not A and B indep

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

Theorem of total Probability and Baye's Theorem



There are Mutually exculsive and exhaustive.

$E_1 \cap E_2 \cap E_3 = \phi$

$E_1 \cup E_2 \cup E_3 = S$

Probability of Black Ball. (A)

$$P(A) = P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2) + P(E_3)\,P(A|E_3)$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

$$P(A) = P(E_1)P(A|E_1) + P(E_2)P(A|E_2) + P(E_3)P(A|E_3)$$

Bay's Theorem.

$$P(E_1|A) = \frac{P(E_1)\,P(A|E_1)}{P(A)}$$

DOWNLOAD : GAMMA CAREER CLASSES AAP!

There are two groups of bags. Group I consists of 3 bags, each containing 5 green balls and 3 blue balls. group II Consists of 2 bags each containing 2 green and 4 blue balls.A bag has been selected and a ball has been drawn at random from one of the bags and is found to be green . Find the probability that this green ball has been drawn from a bag of group II.

Group-1	Group-2
5-green	2 green
3- Blue	4 blue
Total = 8	Total = 6
E_1	E_2

$$P(E_2|A) = \frac{P(E_2)\,P(A|E_2)}{P(A)}$$

$$P(A) = P(E_1)\,P(A|E_1) + P(E_2) \times P(A|E_2)$$

$$P(E_1) = \frac{3}{5} \qquad P(E_2) = \frac{2}{5}$$

$$P(A|E_1) = \frac{5}{8} \qquad P(A|E_2) = \frac{2}{6} = \frac{1}{3}$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!

$$P(E_2|A) = \frac{P(E_2)\,P(A|E_2)}{P(E_1)\,P(A|E_1) + P(E_2) \times P(A|E_2)}$$

$$= \frac{\frac{2}{5} \times \frac{1}{3}}{\frac{3}{5} \times \frac{5}{0} + \frac{2}{5} \times \frac{1}{3}}$$

$$= \frac{16}{61} \quad \text{Ans}$$

GAMMA CAREER CLASSES
MATHS BY ASHWANI SIR

DOWNLOAD : GAMMA CAREER CLASSES AAP!